JOINTING SYSTEM FOR WALL-BUILDING PIECES

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Abstract of **CA2234732**

The logs for a log-cabin wall are joined in interlocking end-to-end abutment. Each log has an end-face, which includes a re-entrant platform. All surfaces on the end-face, including the platforms and the block-surfaces between, face one way, i.e either towards the inside, or towards the outside, of the wall. All the surfaces on the end-face of the interlocking end-face of the adjoining log face the other way. The logs are positioned laterally by means of spline-in-groove engagements with the logs above and below. The platforms are flat, parallel, and perpendicular to the block surfaces, whereby the end-face can be formed by simple saw-cuts. The spline in the log below serves as a watershed to prevent water passing inside, and the re-entrant platform is placed outside the watershed, and includes channels to collect water in the joint, and convey it back outside the wall.

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(54) SYSTEME D'ASSEMBLAGE DE PIECES DE CONSTRUCTION DE MURS
(54) JOINTING SYSTEM FOR WALL-BUILDING PIECES

(57)

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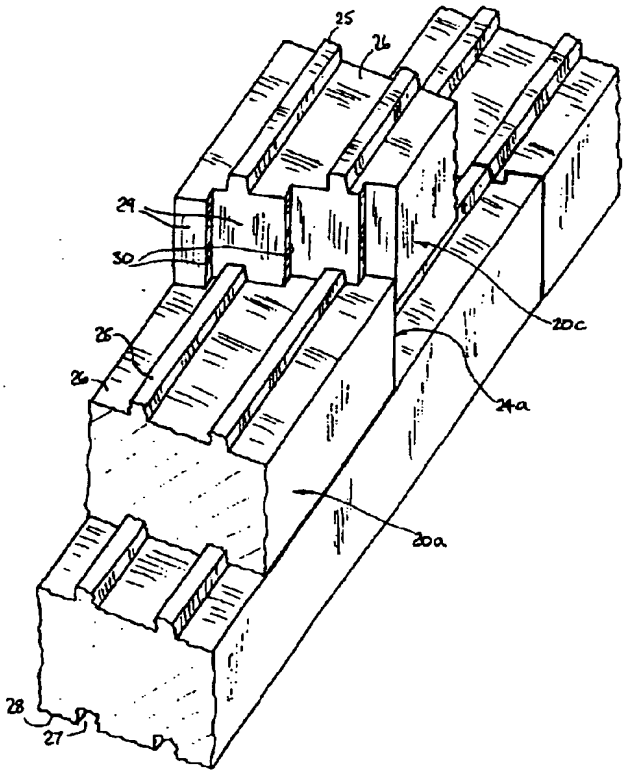
(54) **SYSTEME D'ASSEMBLAGE DE PIECES DE CONSTRUCTION DE MURS**

(54) **JOINTING SYSTEM FOR WALL-BUILDING PIECES**



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Abstract of the Disclosure

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Docket: 873-01

Title: JOINTING SYSTEM FOR WALL-BUILDING PIECES

This invention is applicable for use in joining wood-pieces in building construction, for example in buildings of the log-cabin type, for joining logs end-to-end.

BACKGROUND TO THE INVENTION

It is the common practice in the construction of modern log cabins, to manufacture the logs to the final size and shape in-factory, and to ship the finished logs for assembly on site. It is conventional to provide a means for securing the rows or courses of logs to the courses of logs above and below. This is done by means, for example, of a spline and groove engagement. It is also conventional to clamp the logs together vertically by means of long through-bolts that pass through holes pre-drilled in the logs.

Given that the walls of buildings are longer than the logs, the logs need to be joined end to end, in butt-joints. One of the difficulties of conventional factory-made log cabin construction is that it has been difficult to keep the end-faces of the logs together at the joints, and to stop the logs from separating, and gaps from opening, at the joints. As the joints open, the joints become no longer weather-tight.

It might be considered that the way to keep the butt-joints held tightly together, and to resist separation at the joints, would be to use dovetails. While dovetail joints possible might hold the logs together, they would be hopelessly uneconomical because dovetail joints are far too difficult to assemble, and the dovetail shape cannot be formed in one pass of a saw-blade type of cutter. Dovetail joints would require several passes of a saw-blade (each cut requiring the log and the saws to be re-set) or would require the use of a routing process, which would be far too slow to be contemplated on a mass-production basis.

The invention aims to provide a butt-joint that compares as to physical security with a dovetail joint, but which is far easier

(and less costly) to manufacture and assemble.

The invention also aims to provide a butt-joint that offers excellent weather protection.

The invention aims to be applicable to walls made of pieces of wood, in the form of logs as in a log cabin; in the form of siding; and in the form of large-area sheets. It is an aim that the shapes provided at the joints are easy to cut, using simple machinery.

THE PRIOR ART

Splines and grooves in the upper and lower surfaces are shown in (for example) US-5,638,649 (Hovland, June 1997). A system for butt-jointing logs, in which shaped slots are cut in the logs, and complementarily-shaped pegs are driven through the slots, is shown in US-5,020,289 (Wrightman, June 1991).

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

By way of further explanation of the invention, exemplary embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Fig 1 is a plan view of a portion of a wall of a log cabin, which embodies the invention;
Fig 2 is a pictorial view of the portion of the wall of Fig 1;
Fig 3 is a diagram illustrating a saw-cutting operation during the manufacture of the logs shown in Fig 1;
Fig 4 is a pictorial view of a portion of another wall;
Fig 5 is a pictorial view of two courses (shown separated) of logs, showing a corner in another wall;
Fig 6 is a close-up of a joint between two logs;
Fig 6a shows the joint of Fig 6 with the logs separated;
Fig 7 is the same view as Fig 5 of an alternative construction;
Fig 8a is a side elevation of a wall, shown to illustrate the terminology used;
Fig 8b is a plan view of some pieces of the same wall;

Fig 8c is a pictorial view of one of the pieces of the wall;
Fig 9 is a plan view of a prior art system.

The apparatuses shown in the accompanying drawings and described below are examples which embody the invention. It should be noted that the scope of the invention is defined by the accompanying claims, and not necessarily by specific features of exemplary embodiments.

Fig 1 is a plan view of a wall which comprises several rows or courses of logs. The portion of the course 20 of the wall shown in Fig 1 comprises a log 20a, having a left end-face 23a and a right end-face 24a. The log 20b to the left has a corresponding right end-face 24b, and the log 20c to the right has a corresponding left end-face 23c. The end faces are shaped as shown, and are in end-to-end interlocking configuration.

Each log has splines 25 on its upper surface 26, and corresponding grooves 27 on its lower surface 28. The splines and grooves engage with corresponding grooves and splines in the logs of the respective courses above and below. Since the courses of logs are resting on each other under gravity in a vertical stack, the engagement of the grooves and splines keeps the logs from moving laterally relative to the logs above and below.

Log 20a is prevented from separating lengthwise, or longitudinally, with respect to adjacent log 20b by virtue of the shapes of the end faces 23a and 24b. It will be understood that, because of the interlocking shapes of the end-faces 23a and 24b, the logs 20a,20b,20c, in order to separate longitudinally, would have to move laterally; but the logs cannot move laterally. Logs 20a,20b,20c cannot move laterally relative to each other because of their splines-to-grooves engagement with the logs in the courses above and below. The designer should ensure that the breaks between the logs in the courses above and below do not coincide with the breaks in the course 20.

Fig 2 shows the manner of assembling the wall. The log 20a is already in place, resting in spline-to-groove engagement on the logs in the course below. To assemble the next or junior log 20c

in the course, the end-face 23c of the log 20c is placed to engage with the end-face 23a of the already-placed or senior log 20a. Preferably, the junior log should be carefully engaged face to face, but with the junior log at first held vertically clear of splines-to-grooves engagement with the logs below. After checking that the junior log is aligned correctly, the junior log is lowered to its assembled final position.

The nature of the engagement of the logs, in fact, is such that the junior log cannot be assembled partially; either the junior log 20c is fully and properly engaged with the senior log 20a in the same course, and with the logs in the course below, or the junior log is so far out of engagement that its out-of-engagement status is unmistakably clear.

As shown in Fig 2, the end-face 23c comprises four block-surfaces 29, and three re-entrant platforms 30. The four block-surfaces are all flat planes, which are parallel. Similarly, the three re-entrant platforms 30 are all flat planes, which are parallel, and the platforms 30 lie at right angles to the block-surfaces 29. It is the engagement of the re-entrant platforms 29 on end-face 23c with the corresponding re-entrant platforms on the end-face 24a that locks the logs 20a and 20c together against possible separation in the longitudinal sense.

It may be noted that this engagement locks the logs together very securely, and also locks them together right at the very ends. Thus, any tendency of the logs to shrink, and therefore to separate at the end-faces, is well resisted by the design as shown. The more the logs shrink, the harder the re-entrant platforms will press themselves together.

The splines 25 and grooves 27 may be given a slight draft or taper, as shown. Thus, the logs are easy to assemble together, and the engagement between the splines and grooves only becomes tight at the very last. The designer can even choose to have the fit of the splines to the grooves so tight that the logs have to be finally hammered together.

Of course, the designer must see to it that the logs are cut to shape accurately enough that the logs fit and engage properly

together. It is recognised that the accuracy required in the cutting of the shapes of the logs is readily achieved using conventional industrial methods. The grooves and splines, when straight, can be cut with ordinary plain saw blades, and the surfaces of the logs are cut each in a single pass by running the logs lengthwise under the rotating blades. When tapered, the grooves and splines are cut with respective specially-shaped saw blade cutters, but again the surfaces are cut each in a single lengthwise pass.

Fig 3 shows the saw-blade arrangement for cutting the end-faces of the logs. Here, as shown, four blades 32 are ganged on a single spindle 34. The cut is made by passing the saw-blades through the log (or the log through the saw blades) in the direction into the drawing. This system of shaping the end-face is very accurate as regards the relationship between the successive re-entrant platforms 30 on the end-face. The depth setting of the saw-gang need only be set once, i.e the depth does not need to be individually set, once for each platform.

As shown, the end-faces of the logs are symmetrical about a plane of symmetry that is defined as the vertical plane passing through the longitudinal axis of the log. This symmetry ensures that the logs can be placed with either side surface of the log serving as the outside of the wall. Thus, the builder can select and assemble the logs so that their good sides all face outwards. On the other hand, the end-faces might be made non-symmetrical, deliberately so that the good side can be selected in-factory and that selection enforced on the builder. (The splines and grooves can be arranged non-symmetrically also, if desired.) However, the logs from which houses are built are generally good both sides; therefore, the designer can make assembly a little less restrictive by specifying symmetry of the end-faces, and symmetry of the splines and grooves.

It may be noted that the re-entrant platforms 30 and block-surfaces 29 that make up the end-faces are all vertical. When a junior end-face is properly assembled to an adjoining senior end-face, the junior end-face does not rest upon, and is not supported by, the senior end-face.

The platform 30 is re-entrant in that a line parallel to the longitudinal axis of the log, and emerging from any point on the re-entrant platform, is directed towards (i.e not away from) the main bulk of that log.

Other shapes are contemplated for the end-faces, besides the four-block-three-platform end-face as shown in Figs 1 and 2. In Fig 4, for example, the end-face has three block surfaces and two re-entrant platforms. This is more suitable when the logs are much narrower in width than in height (in which case, the pieces of wood now have the dimensions of siding or cladding, rather than logs).

Fig 5 also illustrates the manner in which corners of the log cabin building can be arranged. Two courses of logs are shown in Fig 5. Corners require the provision of a special-log 36. The special-log 36 is cut with a complementary three-block-two-platform side-end-face 37, which fits the end-face 38 of log 39. All the logs on the same course of logs have a common design of end-face 38, both ends, apart from the special-log 36, of which only one of its end-faces 40 is to the common design.

Gaskets 42 are provided for sealing the corners. Recesses 43,44 are cut in the logs 36,39, which combine to create an accommodation for the gasket 42. The grooves 27 cut in the undersurface of the special-corner-log 39 are ramped out, so as not to leave in the outside surface thereof.

At the corners, a vertical hole 45 is provided right through all the logs. A metal rod can be passed through the holes in all the courses, for tightening the courses together vertically.

It may be noted that the log 39 which abuts the special-log 36 at the corners is (apart from the simple-to-cut recess 43) not itself special. The log 39 is provided simply with the common end-face on both ends, just like the logs that make up the rest of the length of the wall. In other words, all the specialness needed at the corners is provided in and by the special log itself.

Fig 5 shows the end-faces in the lower course being angled in the

opposite sense to the end-faces in the upper course. (Of course, the wall comprises many more courses, which are arranged alternatingly.) By contrast, Fig 2 shows the end-faces angled all in the same sense in successive courses. The problem with the end-faces in all the courses being angled in the same sense, as in Fig 2, is that, at the corners, the side-end-faces would all be in vertical alignment, which is not good.

When the courses shown in Fig 5 are brought together, very effective protection against water ingress is achieved. The spline 25 serves as a watershed, which deflects any water that might collect on the outside land 46 of the upper surface of the log. The first re-entrant platform 47 of the end-face 40 lies to the outside of the watershed formed by the spline 25.

The vicinity of the first re-entrant platform 47 is shown in close-up in Fig 6. Fig 6a shows the two logs separated. The manner of cutting the re-entrant platforms (as was described with reference to Fig 3) in fact leaves a slight undercut at 48, because of the set of the saw-teeth. Also, wood is a material that basically will not support a sharp edge, and so the point 49 is slightly rounded or chamfered. As a result, there are inevitably two small channels 50 formed when the logs are assembled together, at the vicinity of the first re-entrant platform (and any other re-entrant platforms). These channels serve to receive and collect any water that might enter the gap 52. Under driving rain conditions, water might penetrate forcefully into the gap 52, but once the water reaches the channels 50 its energy is spent, and the water now simply seeps down the channels. If desired, the channels can be purposely cut larger, by modifying the saw blades in Fig 3. However, it is recognised that the kind of channels 50 that arise naturally, with standard saw-blades, are adequate in most cases.

The bottom mouth of the channels 50 opens right onto the outside land 46 on the upper surface of the log below. The watershed prevents the water penetrating to the inside, and the water harmlessly emerges outwards from the land 46, and outside.

This system of placing the first re-entrant platform outside the watershed provides a very effective protection against water-

penetration. The labyrinth of surfaces and facets between the logs also provides excellent protection against air penetration, whereby any air that might leak through the wall has so little energy that it can hardly give rise to a draft. The gaskets 42 provide extra draft and water protection at the corners.

Fig 7 shows how the system of placing the first re-entrant platform outside the watershed can be put into effect even when using large sheets of wood. The upper and lower surfaces of the sheets are tented, as at 54, which serves as the watershed. The end-edges 56 of the sheets have the complementary re-entrant platforms, as previously described.

One of the problems with systems of interlocking edges of sheets together can be that the sheets have to be slid into engagement lengthwise, which can be very inconvenient. In the design as shown, the sheets do not have to be assembled. In fact, the sheets only interlock tightly upon final assembly into position, and yet the joints are physically robust and secure, and weather protection is excellent.

As to weather-proof sealing, in the configurations as shown the logs can be expected to hold themselves together so tightly that light caulking between the joints during assembly is all that is needed to keep the joints weather-tight for many years. Alternatively, gasket-retaining seal-grooves can be provided in the logs at appropriate locations. Although more labour-intensive during assembly, caulking is generally preferred over gaskets, in that caulking can be inspected from outside the finished wall, and caulking can be replaced, at least to some extent, from outside the finished wall (which a gasket cannot). The problem with caulking as a method of sealing the logs in conventional log cabin construction has been that caulking cannot cope with distortions that tend, over the years, to cause separation of the logs, especially at the corners; but that tendency is reduced to a minimum in the present design, whereby caulking is more likely to be acceptable.

The scope of the invention is defined in the accompanying claims. Figs 8a,8b,8c illustrate how the terminology used in the claims applies to the depicted embodiment.

Fig 9 shows a prior art system for joining pieces of wood siding. It will be noted that of course this system provides little protection against water penetration.

Claims

CLAIM 1. A wall, comprising many pieces, arranged in horizontal courses, one above another, wherein:

piece A has multi-faceted top and bottom surfaces TSA and BSA, which are so shaped as to comprise lateral-interlocking-means in combination with corresponding surfaces BSM of piece M above and TSN of piece N below;

the lateral-interlocking-means between TSA and BSM, and between BSA and TSN, when engaged, are such as to prevent the piece A from moving laterally sideways relative to the piece M above and the piece N below;

piece A has inside and outside opposing side-surfaces, ISA and OSA, which lie respectively to the inside and the outside of the wall of pieces;

the top surface TSN of piece N defines a top-watershed, TWN, parallel to the longitudinal axis of piece N, in that no facet of the top surface TSN lying to the outside of the top-watershed TWN has an inwards-facing-component, and in that a facet of the surface TSN lying to the inside of the top-watershed TWN has an inwards-facing component;

piece A has opposing multi-faceted end-surfaces, LSA and RSA, respectively at the left and right longitudinal ends of piece A, LSA and RSA being so shaped as to comprise longitudinal-interlocking-means in combination with corresponding surfaces RSB of piece B to the left, and LSC of piece C to the right;

the longitudinal-interlocking-means between LSA and RSB, and between RSA and LSC, when engaged, are such as to prevent the piece A from moving longitudinally relative to the pieces B and C;

one of the facets of the multi-faceted end-surface LSA comprises a re-entrant facet LSA-RE, which is re-entrant in the sense that the facet LSA-RE has a component parallel to the longitudinal axis of piece A, which is directed towards the bulk of piece A;

the end-surface RSB of piece B that interlocks with LSA has a corresponding re-entrant facet RSB-RE, which is re-entrant in the sense that the facet RSB-RE has a component parallel to the longitudinal axis of piece B, which is directed towards the bulk of piece B;

the re-entrant facets LSA-RE and RSB-RE lie to the outside of the

top-watershed TWN of the surface TSN, between the top-watershed TWN and the outside surface OSN of piece N;

whereby water present between the re-entrant facets LSA-RE and RSB-RE, and seeping downwards, is directed by the top-watershed TWN to the outside of piece N, and cannot pass to the inside of piece N.

CLAIM 2. Wall of claim 1, wherein the pieces are pieces of wood.

CLAIM 3. Wall of claim 2, wherein the pieces are logs of a log cabin structure, having a cross-sectional thickness between about 10 and 20 cm, and a height between about 10 and 20 cm.

CLAIM 4. Wall of claim 2, wherein the pieces are pieces of siding, having a cross-sectional thickness between about 1 and 2 cm, and a height between about 10 and 20 cm.

CLAIM 5. Wall of claim 2, wherein the pieces are pieces of sheeting, having a cross-sectional thickness between about 1 and 2 cm, and a height of 100 cm or more.

CLAIM 6. Wall of claim 1, wherein the bottom surface BSA of piece A defines a complementary bottom-watershed BWA.

CLAIM 7. Wall of claim 1, wherein:

the interlocking end-surfaces LSA and RSB fit together in nominal touching contact over substantially the whole area thereof, except as follows;

the interlocking end-surfaces LSA and RSB, in the vicinity of the facets LSA-RE and RSB-RE are so configured as to define a vertical channel therebetween, which extends over the height of the piece A, and which is so positioned as to collect water from between LSA-RE and RSB-RE;

the channel has an exit mouth at the bottom thereof, and the exit mouth is so located as to conduct water emerging therefrom onto a point on the top surface TSN of the piece N below, which is outside of the top-watershed TWN.

CLAIM 8. Wall of claim 1, wherein the lateral-interlocking-means between surfaces BSA and TSN comprises a spline formed on TSN and a complementary groove formed in BSA, and the top-

watershed TWN comprises the top of the spline.

CLAIM 9. Wall of claim 1, wherein the lateral-interlocking-means comprises two splines in TSN and two complementary grooves in BSA, in parallel side-by-side relationship, and the top-watershed TWN comprises the top of the spline nearest the outside of the wall.

CLAIM 10. Wall of claim 1, wherein the pieces A and B are interlocked but not dovetailed, in that:

the multi-faceted end-surface LSA is so configured that, in respect of at least some points on LSA, lines drawn horizontally, and at right angles to the axis of the piece A, and emerging from the said points, emerge in a directional sense that is directed towards the inside of the wall;

the end-surface LSA is so configured that there is no point on LSA in respect of which a line drawn parallel to the axis and emerging from a point on LSA, emerges in a directional sense that is directed towards the outside of the wall;

the multi-faceted end-surface RSB is so configured that, in respect of at least some points on RSB, lines drawn horizontally, and at right angles to the axis of the piece A, and emerging from the said points, emerge in a directional sense that is directed towards the outside of the wall;

the end-surface RSB is so configured that there is no point on RSB in respect of which a line drawn parallel to the axis and emerging from a point on RSB, emerges in a directional sense that is directed towards the inside of the wall.

CLAIM 11. Wall of claim 1, wherein the left end-surfaces LSA, LSB, LSC, etc, of the pieces in a course are all of the same configuration, and are of a complementary configuration to the right end-surfaces RSA, RSB, RSC, etc.

CLAIM 12. Wall of claim 1, wherein the re-entrant facets LSA-RE and RSB-RE are flat, planar, vertical, and parallel to each other.

CLAIM 13. Wall of claim 1, wherein:

the left end-surface LSA of piece A includes a second re-entrant facet, LSA-RE2, which is separate from LSA-RE;
the right end-surface RSB of piece B includes a complementary second re-entrant facet, RSB-RE2, which is separate from RSB-RE;
LSA-RE2 is separately flat, planar, vertical, and parallel to LSA-RE, and is complementary to, and in interlocking engagement with, RSB-RE2;
and LSA-RE2 and RSB-RE2 lie on the inside of the top-watershed of piece N.

CLAIM 14. Wall of claim 13, wherein the re-entrant facets LSA-RE and LSA-RE2 are separated from each other, and from the side-surfaces OSA and ISA of piece A, by intercalated block-facets of LSA;
the end-surface LSA is so configured that the block-facets of LSA face away from the main bulk of the piece A.

CLAIM 15. Wall of claim 14, wherein the block-facets are separated from each other, and are separately flat, planar, vertical, and parallel to each other.

CLAIM 16. Wall of claim 15, wherein the block-facets of LSA lie at right angles to the re-entrant-facet LSA-RE.

CLAIM 17. Wall of claim 1, wherein the wall includes a piece E, and a piece F which is configured as a special corner piece;
the axis of the piece E lies at right angles to the axis of the piece F, around a corner of the wall;
the piece E has an end-surface LSE, which corresponds to the end-surface LSA of piece A;
the special-corner-piece F has a side-end-surface, which is complementary to the end-surface LSE;
the side-end-face of the special-corner-piece F lies in interlocking engagement with end-surface LSE of piece E.

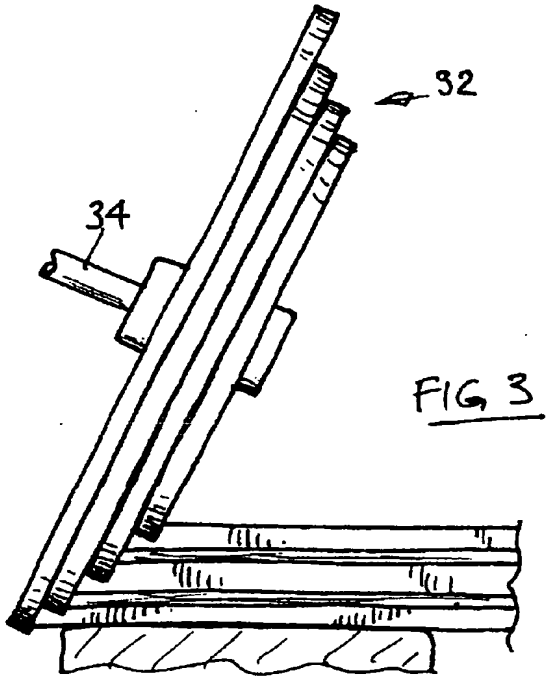


FIG 3

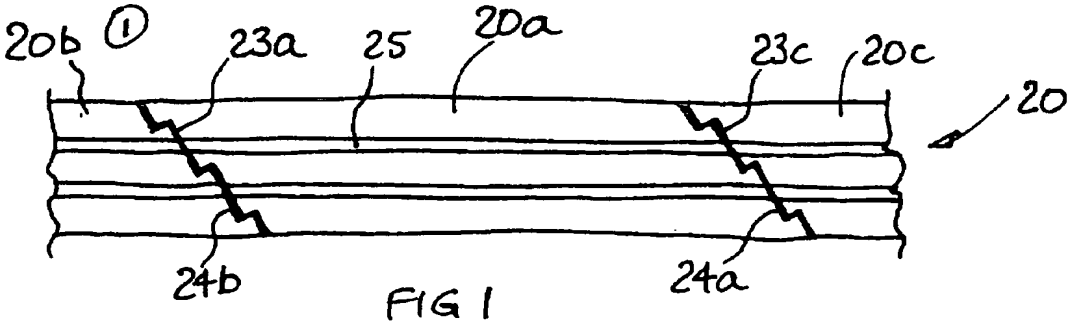
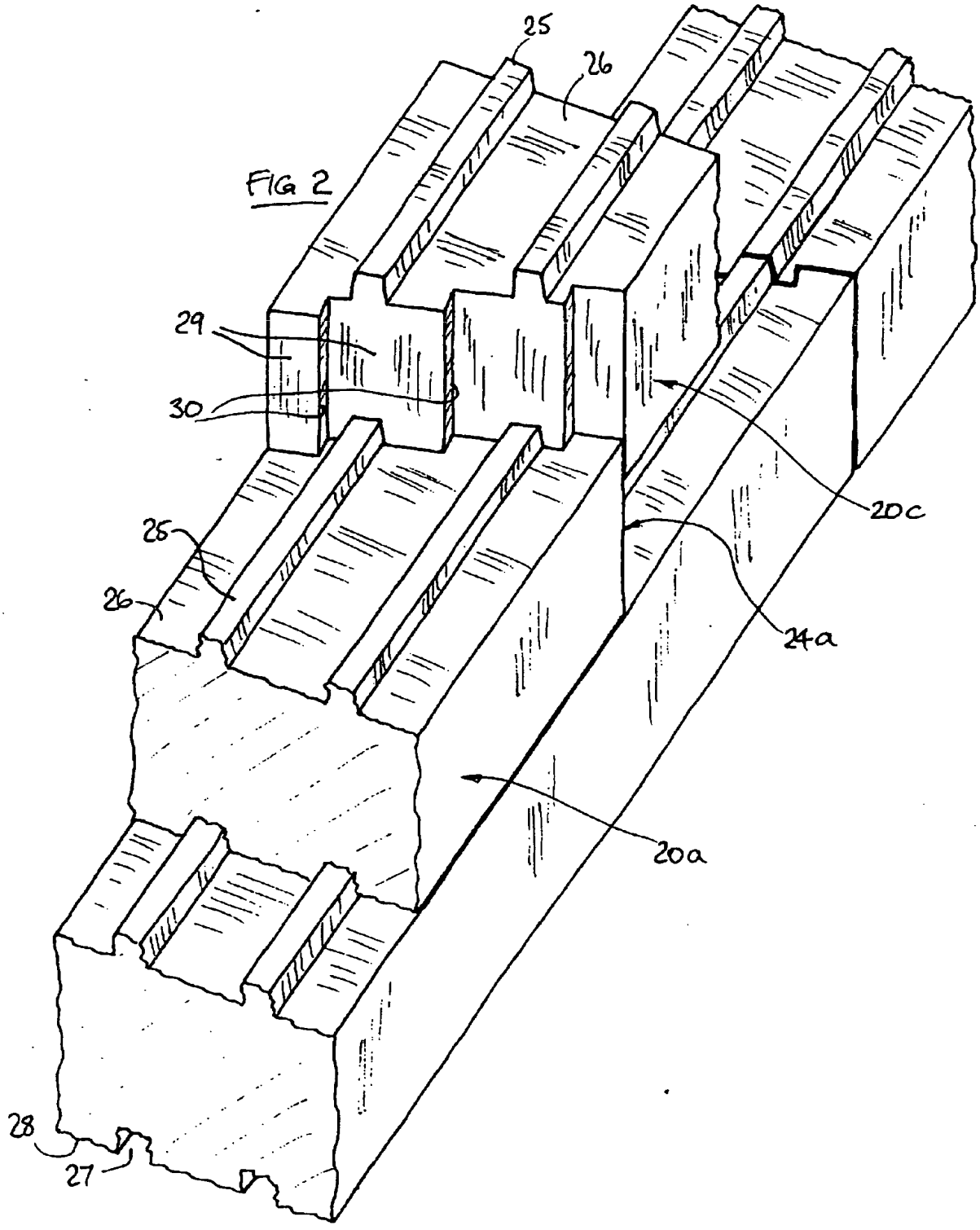


FIG 1

FIG 2



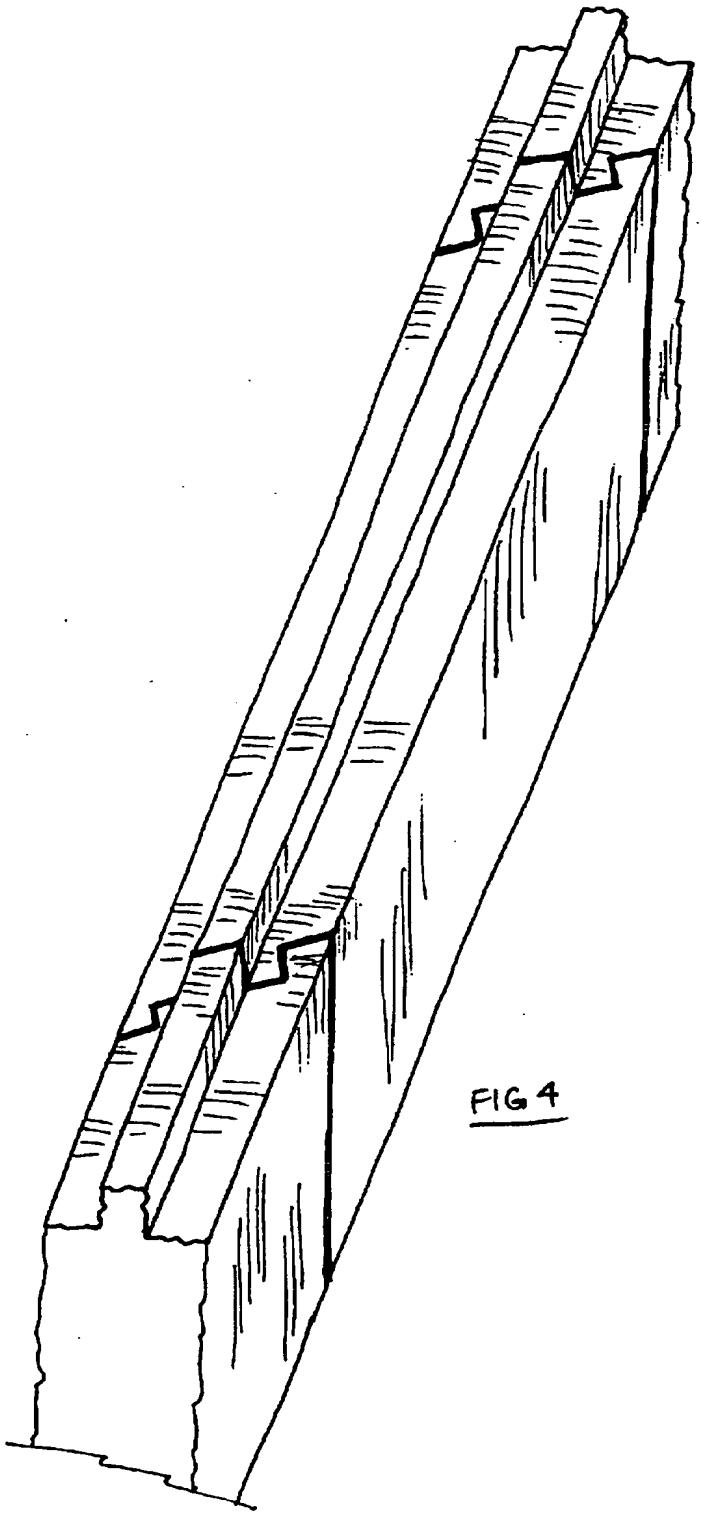


FIG 4

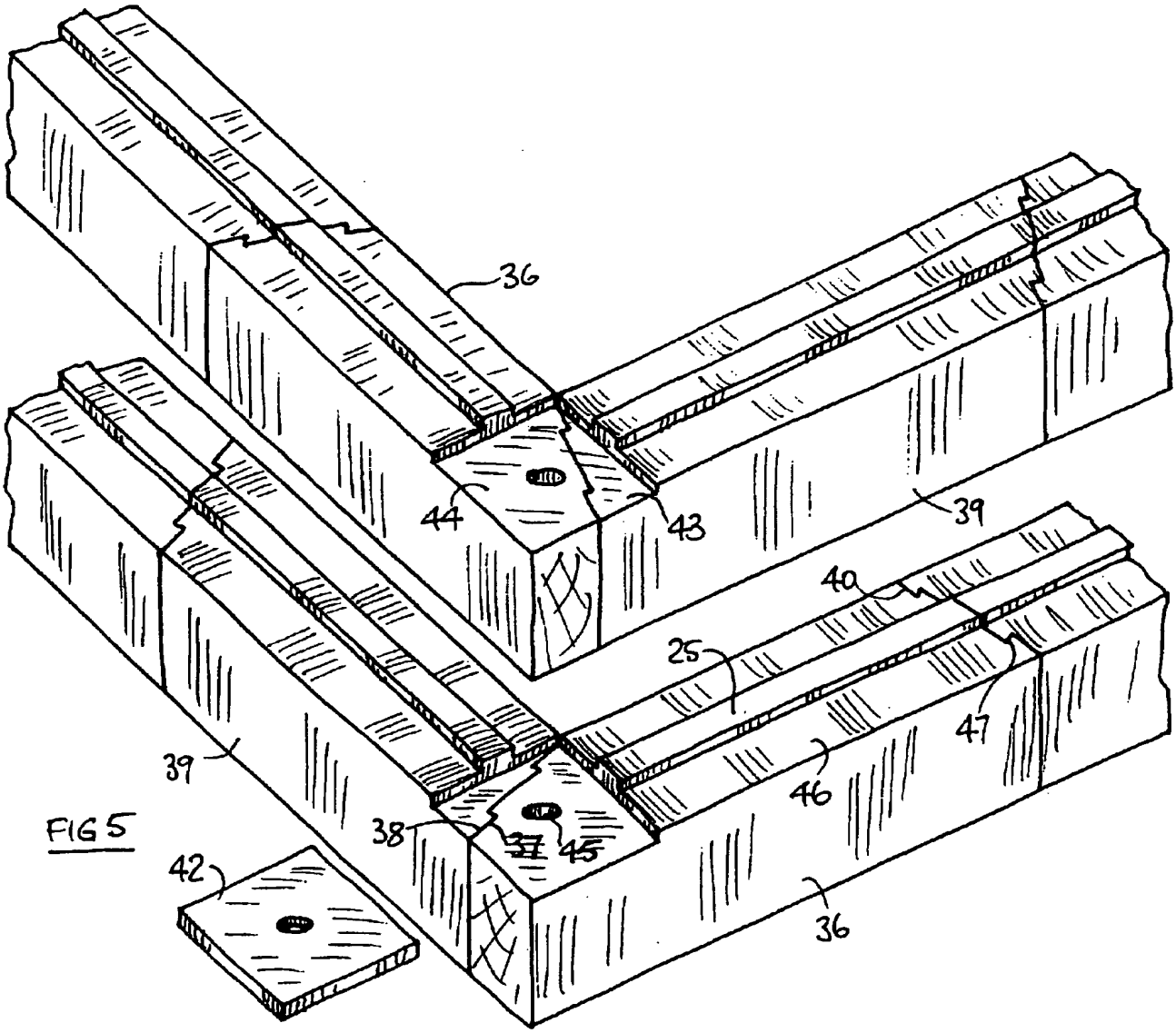
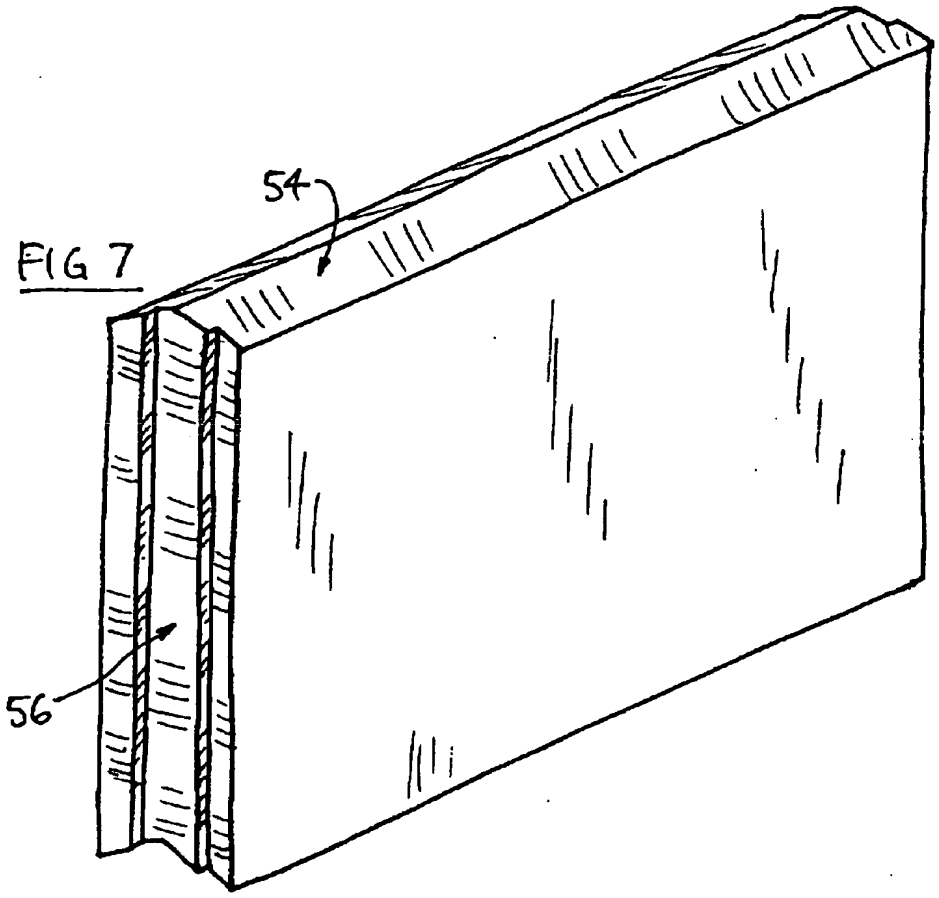


FIG 5

FIG 7



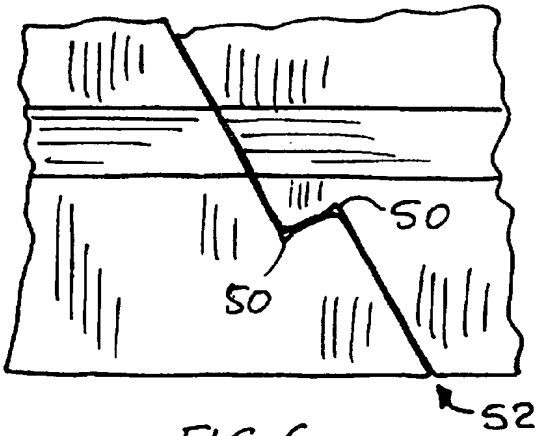


FIG 6

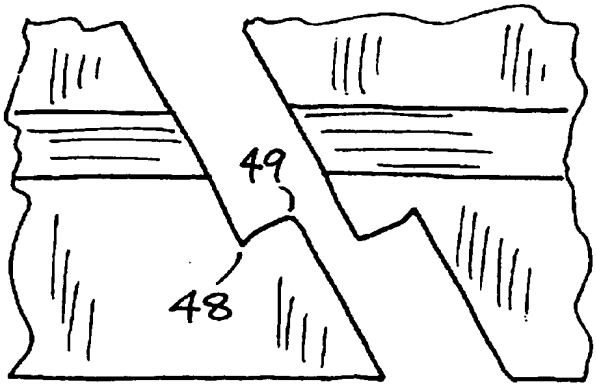


FIG 6a

FIG 8a

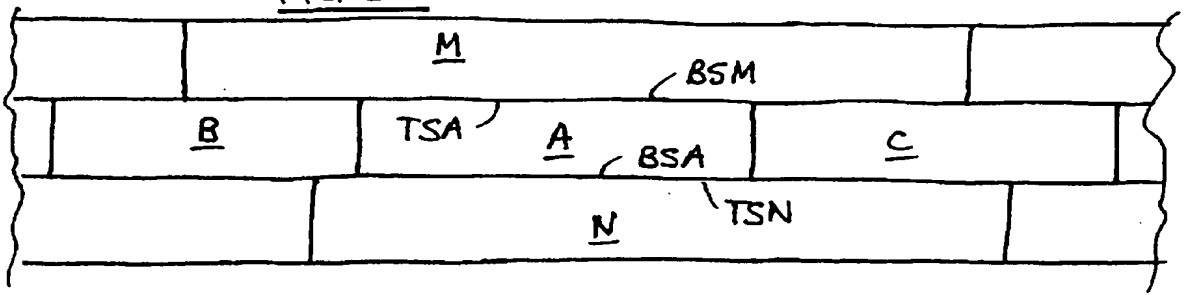


FIG 8b

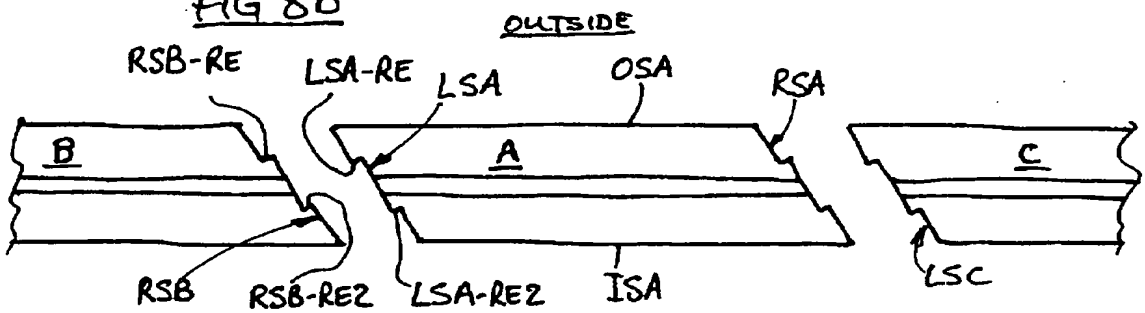
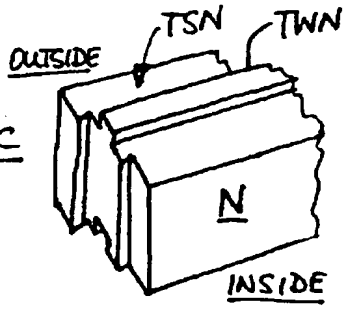


FIG 8c



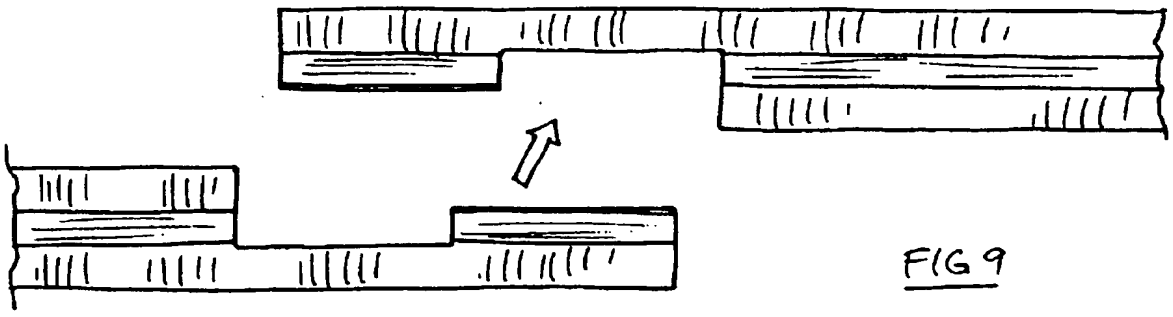


FIG 9

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